REMARKS

Review and reconsideration on the merits are requested.

The amendments to claim 1 find support at page 6, lines 11-16 of the specification.

Claim 3 finds basis at page 4, lines 24-29, page 5, line 4-9, page 5, lines 15-17 and page 5, lines 19-26.

Applicants first address the rejections under 35 U.S.C. § 112, and follow the paragraphing of the Examiner.

Paragraphs 2-4.

Applicants adopt the Examiner's suggestion and so amend the claims.

Paragraph 6

The Examiner urges that "plate-shape" and "plate" are unclear and confusing in that it is uncertain what is meant by the word "plate", etc.

Applicants use --board-shaped-- and --board--, respectively, because the term "flat plate-shaped laminate" means a flat board-shaped laminate and the term "plate" means a board in the present specification.

The specification will be amended to change "plate" and similar terminology to "board" and similar terminology.

Withdrawal is requested.

If the Examiner believes that some terminology other than "board" would be better terminology, the Examiner is requested to contact the undersigned so this may be discussed during a telephone interview at the later given telephone exchange.

Withdrawal of all the rejections under 35 U.S.C. § 112, is requested.

The prior art: U.S. Patent 5,954,898 McKague et al (McKague); EP 0775561 Yokokita et al (Yokokita).

The art rejections: claim 1 as anticipated by McKague. Paragraph 8 of the Action. Claim 1 as anticipated by Yokokita. (Paragraph 9 of the Action). Claim 2 as obvious over McKague (Paragraph 11 of the Action). Claims 1 and 2 as obvious over McKague in view of Yokokita. (Paragraph 12 of the Action). Claims 1 and 2 as obvious over Yokokita in view of McKague. (Paragraph 13 of the Action).

These rejections are respectfully traversed.

The Examiner's position is set forth in the Action and will not be repeated here except as necessary to an understanding of Applicant's' traversal which is now presented.

Applicant first addresses the anticipation rejection over McKague.

As is clear from the specification of the present application, page 2, the method of the present invention was reached based on the finding that: "an intermediate product made of a fiber-reinforced composite can be easily produced by reduced processes if a flat plate-shaped laminate of a plurality of fiber-reinforced composite sheets is provided beforehand and appropriately formed" (emphasis added; board-shaped is now used). Thus, the method for producing an intermediate product made of a fiber-reinforced composite composed of a reinforcing fiber impregnated with a thermosetting rein or a thermoplastic resin comprises the steps of: (a) the first process where a plurality of sheets (1a, 1b, 1c, 1d, 1e) made of the fiber-reinforced composite are laminated to each other automatically, heated under a pressure by a hot press roll, and cooled under a pressure by a cold press roll to provide automatically a flat board-

shaped laminate; (b) the second process where the flat board-shaped laminate is cut into a board (2b, 2c, 2d); and (c) the third process where the board is softened by heating, placed on a forming tool, and formed by cooling under a pressure (see page 2, lines 1-17, and amended claim 1 of the specification)."

In this regard, when the fiber-reinforced composite is composed of a reinforcing fiber impregnated with a thermosetting resin or a thermoplastic resin, the intermediate product is preferably a semi-hardened product having a hardening degree of 1 to 50 %. The method of the present invention is suited for producing such a semi-hardened product (emphasis added) (see page 2, line 15-21 of the specification).

The present invention is limited to producing an intermediate product made of a fiber-reinforced composite, preferably as semi-hardened products such as a stringer, a frame, etc., obtained by steps (a) to (c) mentioned above. Further, the method of the present invention improves the conventional methods for producing intermediate products comprising the steps of cutting fiber-reinforced composites many times to obtain the desired lamination structures, respectively; laminating the fiber-reinforced composites on a forming tool to provide a laminate; and forming the laminate, by reduced processes without complicated steps (see page 1, lines 7-27 of the specification).

In contrast to the present invention, McKague discloses a method for fabricating a composite part from a plurality of composite layers, the part having a final shape, thickness, and density, the method comprising the steps of.

(1) laying-up the composite layers one upon another to form a collection of layers in a configuration, each layer comprising a thermosetting matrix reinforced by fibers;

(2) debulking the configuration of layers by applying a pressure sufficient to reduce the thickness of the layers to within approximately twenty percent (20%) of the part's final thickness,

(3) heating the debulked layers to a temperature above their glass transition temperature to partially cure the layers;

(4) forming the partially-cured layers into the part's final shape; and

(5) continuing the application of heat to the layers while holding them in the part's final shape with sufficient force to achieve and maintain the part's thickness and density and until the heating causes the layers to become sufficiently cured so that the part's final shape, thickness, and density are maintained (emphasis added) (see claim 1; column 2, line 66 to column 3, line 16).

In this regard, a thermosetting resin (e.g., an epoxy resin) generally does not have a glass transition temperature. Since the Tg is a characteristic or inherent value for a material, the following recitation at column 7, lines 13-15 of McKague is not precisely correct:

"This increased viscosity is the result of changing the Tg of the resin through heating while debulking and makes the debulked composite material stable at room temperature (emphasis added)."

However, in view of the disclosure at lines 1-4 of column 7 of McKague:

"the viscosity of the resin begins to increase slightly as a result of a linear polymer chain extension forming in the composite material (emphasis added)", it seems that the Tg of McKague may have another specific meaning.

In this regard, the Tg of Material 8551-7A disclosed in Table 11 on columns 13 and 14 of McKague ranges from 398°F to 411°F.

Turning to the technical features of McKague, steps (1), (2) and (3) of McKague correspond to step (a) of the present application and step (5) corresponds to step (c) of the present invention, though not containing the limits of claim 1 (amended).

In McKague, the individual lamina layers 26 are formed into a conventional shape such as flat sheet 28, and the "lay-up" process may be accomplished either by hand or an appropriate placement machine. Debulking of layer 26 is carried out by pressure rolling or plate pressing and heating of the laminated sheet 28 is carried out using an appropriate heating source like oven 30 in combination with the pressure rolling or plate pressing (see Fig. 2: column 5, lines 46-49, 52-53 and 62-64).

In contrast to steps (1), (2) and (3) of McKague, in step (a) of the present invention, a plurality of sheets made of the fiber-reinforced composite are laminated to each other automatically, heated under a pressure by a hot press roll, and cooled under pressure by a cold press roll to provide automatically a flat board-shaped laminate (emphasis added).

Specifically, in the step (a), the sheets are preferably heated at 20 to 100 °C under pressure by a hot press roll, a hot pressing machine, etc. Further, the pressure is preferably 0.1 to 10 kg/cm^2 (see page 4, line 24 to page 5, line 3 of the specification).

The sheets are preferably cooled at 10 to 30°C under pressure by a cold press roll, a cold pressing machine, etc. When the cooling temperature is more than 30°C, a sheet tends to peel off the flat board-shaped laminate. On the other hand, a cooling temperature of less than 10°C requires a great amount of energy for cooling. Further, the pressure is preferably 0.1 to 10 kg/cm^2. A pressure of more than 10 kg/cm^2 results in disordered fiber orientation of the fiber reinforced composite, and a pressure of less than 0.1 kg/cm^2 leads to insufficient stacking of the flat board-shaped laminate (see page 5, lines 4-11 of the specification).

In McKague, heating of uncured or partially cured laminate 34 is continued in oven 36 or other suitable means to a temperature greater than the Tg for the composite material. While hot, laminate 34 may be reshaped through the application of appropriate force by tool 38 and form 40, thereby forming part 42, and, as necessary, heating may be continued until curing of the composite material has advanced sufficiently so that the final shape of part 42 can be maintained during subsequent operations, including additional curing (see Fig. 2: column 6, lines 17-20 and 34-38).

In contrast to step (5) of McKague, in the step (c) of present invention, the board is softened by heating, placed on a forming tool, and formed by <u>cooling under a pressure</u> (emphasis added).

Specifically, in step (c) of the invention, the softened board may be cooled under pressure by a cold press roll, a cold pressing machine, etc. The cooling temperature is preferably 0 to 50 °C, more preferably 20 to 40°C. When the cooling temperature is more than 50°C, the formed product returns to a board shape due to insufficient cooling. On the other hand, when the cooling temperature is less than 0°C, fluidity of the resin in the fiber-reinforced composite is reduced too much before forming, resulting in insufficient forming. Further, the pressure is preferably 0.1 to 10 kg/cm^2. A pressure of more than 10 kg/cm^2 results in disordered fiber orientation of the fiber-reinforced composite, and a pressure of less than 0.1 kg/cm^2 leads to insufficient forming. In step (c), the forming tool may be made of a steel, aluminum, etc.

McKague does not teach or suggest cooling under a pressure in steps (2), (3) and (5), though McKague may describe that the debulked laminate 34, which is uncured or only partially cured, can generally be stored at room temperature (see column 6, lines 5-9).

Further, in the present invention the flat board-shaped laminate 2a is automatically easily provided by a device having a hot press roll 3 and a cold press roll 4 (see Fig. 1 and page 6, lines 11-16 of the specification).

In contrast, in McKague, as far as the processing in flow 24 of Fig. 2 is concerned, laminate 34 is not provided automatically because of the use of oven 36 (different from the press roll in the machinery), an autoclave, for heating uncured or partially cured laminate 34 (see Fig. 2 and column 6, lines 16-19; note also heating laminate 82 in oven 80 in flow 74 of Fig. 4: column 7, lines 37-52), although McKague teaches the use of automatic machinery to lay-up individual lamina layers 26 (see column 5, lines 36-44).

Quite clearly, a much greater reduction in processing costs would result in accordance with the present invention as compared to McKague, which Applicant submits to be quite clearly an unobvious and unexpected benefit achieved in accordance with the present invention as compared to McKague.

Since Applicants clearly have avoided the anticipation rejection over McKague, and there is no motivation provided in McKague to reach the invention as defined in claim 1 (amended) of the present application, Applicant respectfully submit that claim 1 (amended) is not anticipated by nor rendered obvious by McKague.

Applicant now addresses the anticipation rejection of claim 1 over Yokokita.

Yokokita discloses (1) a glass fiber mat for a stampable sheet, (2) a production process thereof, (3) a stampable sheet employing the glass fiber mat, (4) a production process therefor, and (5) a production system therefor (see page 2, lines 5-6: two first lines of the Yokokita "FIELD"). Since the glass fiber mat per se for a stampable sheet is a structural product using glass fiber as a reinforcement fiber, it is quite clear that the features of items (1), (2) and (5) disclosed in Yokokita fall outside the scope of the present invention.

In this regard, the stampable sheet of Yokokita is used to obtain a formed product having high dimensional stability and low fluctuation of strength and anisotropy by employing a glass fiber mat for the stampable sheet, which is derived from a continuous glass fiber (long fiber having a fiber length greater than or equal to 10 mm and short fiber (having a fiber length less than 10 mm), so that the stampable sheet has the advantage of long fiber reinforcement and short fiber reinforcement (see page 9, lines 7-13).

According to the disclosure at page 5 of Yokokita, a stampable sheet comprising a plurality of sheets (M, F, F', F") is produced by supplying glass fiber mat M with thermoplastic resin melt F and thermoplastic resin films F' and F" to form a glass fiber-reinforced composite made of two layers of the glass fiber via processes comprising impregnating the resin with the glass fiber and the thermoplastic resin films by applying heat and pressure, followed by cooling the resin impregnated laminate under pressure to form the same into a sheet (not a flat board-shaped laminate) (see page 5, lines 13-19). The sheet is subjected to cutting to form a stacking of stampable sheets (see Fig. 1). In distinction, in the first process (a) of the present invention, a flat board-shaped laminate (2a) is produced by laminating a plurality of sheets (1 a, l b, 1 c, 1 d, 1 e) each made of a fiber-reinforced composite to each other, followed by heating under pressure and cooling under pressure (emphasis added) (see page 6, lines 11-16 of the specification). Thus, the stacking of the stampable sheets shown in Fig. 1 of Yokokita would be supplied as a plurality of sheets each made of the fiber-reinforced composite to form a corresponding flat laminate.

Quite clearly, steps (b) and (c) of the present claims herein are in no fashion disclosed or suggested in Yokokita, and for that reason alone any anticipation rejection based on Yokokita is improper.

Further, the final product of the present invention is a semi-hardened product having a hardening degree of 1 to 50 %. To obtain the semi-hardened product as such, a first major distinguishing feature of a preferred aspect of the present invention from Yokokita lies in that first step (a) recited in claim 1 is carried out under the conditions such that a plurality of sheets each made of a fiber-reinforced composite are laminated to each other, heated at a temperature of

20-100°C under a pressure of 0.1 to 10 kg/cm^2, and cooled at a temperature of 10-30°C under a pressure of 0.1 to 10 kg/cm^2 to provide a flat board-shaped laminate (see page 4, line 24 to page 5, line 11 of the specification).

A second major distinguishing feature of a preferred aspect of the present invention from Yokokita lies in that the third step (c) recited in claim 1 is carried out under the conditions such that the cut board is softened by heating at a temperature of 60-100°C for 10-90 minutes while placed on a forming tool, and formed by cooling at a temperature of 0-50°C under a pressure of 0.1-10 kg/cm^2 to obtain a semi-hardened product having a hardening degree of 1 to 50 % (see page 5, lines 19-28 of the specification).

In contrast to the present invention, the final product of Yokokita, i.e., a stampable sheet, particularly each stampable sheet of Examples 1-4 of Yokokita shown in Table 3, is a solid product having a tensile strength ranging from 6.8-8.0 (kgf/mm^2) (referring to Evaluation Method for (c) Mechanical Property on page 7 of Yokokita, as the units are not shown in Table 3), which is different from the state of the preferred semi-hardened product having a hardening degree of 1 to 50 % of the present invention.

As a consequence, one of ordinary skill in the art referring to Yokokita, which teaches a stampable sheet having a tensile strength ranging 6.8-8.0 kgf/mm^2 but is silent regarding not only a semi-hardened product having a hardening degree of 1 to 50 % but also step (a) for producing a plurality of sheets each made of a fiber-reinforced composite under the specified conditions mentioned above to provide a flat board-shaped laminate, and step (c) for subjecting the cut board to softening by heating at a temperature of 60-100°C for 10-90 minutes placed on a

forming tool, and forming by cooling at a temperature of 0-50°C under a pressure of 0.1-10 kg/cm^2, would clearly not find the claims of the present application anticipated by Yokokita and, Applicant respectfully submits, in no fashion would find the claims of the present application obvious over Yokokita.

Withdrawal of the anticipation rejection over Yokokita is respectfully requested.

Applicant now addresses the rejection of claim 2 as obvious over McKague, and first respectfully submit that the patentability of claim 2 is clearly established by the above discussion regarding claim 1 (amended). Nonetheless, Applicant would like to offer few additional comments regarding the non-obviousness of claim 2 over McKague.

Claim 2 of the present application recites "The method for producing an intermediate product according to claim 1, wherein said intermediate product is a semi-hardened product having a hardening degree of 1 to 50 %, said fiber-reinforced composite being composed of a reinforcing fiber impregnated with a thermosetting resin."

Thus, the ultimate intermediate product of the present invention recited in claim 2 is a semi-hardened product having a hardening degree of 1 to 50 % that can be easily handled and stored and which has <u>properties suitable for integration with a skin element</u> (emphasis added).

As described in the specification of the present application, page 4, in the present invention, "semi-hardened state" means such that the hardening degree of the fiber-reinforced composite is 1 to 80 %. In the case where a semi-hardened stringer intermediate product or a semi-hardened frame intermediate product is produced by the method according to the present invention, the intermediate product is preferably a semi-hardened product having a hardening

degree of 1 to 50 %, such that the same can be easily handled and stored and which has properties suitable for integration with the skin. The hardening degree is more preferably 5 to 20 % (see page 4, lines 7-14 of the description).

McKague is silent regarding any "semi-hardened state" of the McKague fiber-reinforced composite, particularly, a semi-hardened product having a hardening degree of 1 to 50 %. Further, McKague does not teach or suggest any method for producing an intermediate product made of a fiber-reinforced composite as such defined in claim 1 (amended).

Applicant thus respectfully submits that one of ordinary skill in the art, referring to McKague, would not be motivated to reach the present invention as defined in claim 2 of the present application and, accordingly, submits that claim 2 is unobvious over McKague.

To even further emphasize the distinguishing features of the present claims from McKague, though quite clearly claims 1 and 2 as currently presented are not anticipated by nor rendered obvious by McKague, Applicant presents new claim 3 which further recites process conditions in steps (a) and (c) of claim 1.

Quite clearly, claim 3 is neither anticipated by nor rendered obvious by McKague.

Withdrawal of the obviousness rejection over McKague is requested.

Applicant now turn to the obviousness rejection based on McKague in view of Yokokita.

With respect to claim 1 (amended), Applicant has presented in detail his position regarding McKague using a thermosetting resin and Yokokita using a thermoplastic resin, and, in summary, Applicant respectfully submits that neither McKague nor Yokokita, alone or in combination, teach steps (a) and (c) defined in claim 1 (amended), both of which are important

features in accordance with the present invention. Further, it would seem quite clear that the stampable sheet of Yokokita would not be a semi-hardened product having a hardening degree of 1 to 50%.

Applicant thus respectfully submit that the obviousness rejection over McKague in view of Yokokita is improper and should be withdrawn.

Applicant now addresses the obviousness rejection based on Yokokita in view of McKague.

With respect to claim 1 (amended), it is believed that the patentability of claim 1 is clearly established from the earlier presented discussion.

Similar remarks apply to claim 2, Applicant specifically wishing to emphasize that McKague is silent regarding a semi-hardened product having a hardening degree of 1 to 50% as recited in claim 2.

Further, the Yokokita process does not include steps (b) and (c) recited in claim 1 (amended) of the present application. Accordingly, one of ordinary skill in the art referring to Yokokita, based on the use of a thermoplastic resin, would not be motivated to reach the method comprising steps (a), (b) and (c) of the present claims. Further, Applicant submits this is the case even if Yokokita were for some reason to be combined with McKague.

Withdrawal is requested.

For the following discussion, Applicants assume that one of ordinary skill in the art would be led to interchange thermosetting and thermoplastic resins, if, in fact, the heating in steps (a) and (c) in claim 1 of the present application (which would correspond to steps (1) - (3)

and (5) in McKague) were to be carried out at a temperature of 100°C or less as it is not necessary to complete curing of the thermosetting resin independent of the Tg of the resin used.

However, the curing temperature of from 250-350°F (121.1-176.7°C) employed in the Experiments of McKague (see Tables I and II at cols. 11-12 and 13-14, respectively) falls outside at least the heating temperature of step (c) of the present claims.

In this regard, since the Tg of Material 8551-7A in McKague is 398-411°F (203.3-210°C), the heating temperature in step (3) in McKague to obtain partially-cured layers should be more than 398-411°F (203.3-210°C), which falls outside the heating temperature of the step (a) of the present invention.

Withdrawal of all rejections is requested.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1 is amended as follows:

1. (Amended) A method for producing an intermediate product made of a fiber-reinforced composite composed of a reinforcing fiber impregnated with a thermosetting resin or a thermoplastic resin, comprising: (a) [the] a first process where a plurality of sheets made of said fiber-reinforced composite are laminated to each other automatically, heated under a pressure by a hot press roll, and cooled under a pressure by a cold press roll to provide automatically a flat [plate-shaped] board-shaped laminate; (b) [the] a second process where said flat [plate-shaped] board-shaped laminate is cut into a [plate] board; and (c) [the] a third process where said plate is softened by heating, placed on a forming tool, and formed by cooling under a pressure.

Claim 3 was added as a new claim.